

IEM's AI Modeling: Short-term COVID-19 Projections

Date: 5/25/21

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 5/25/21 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

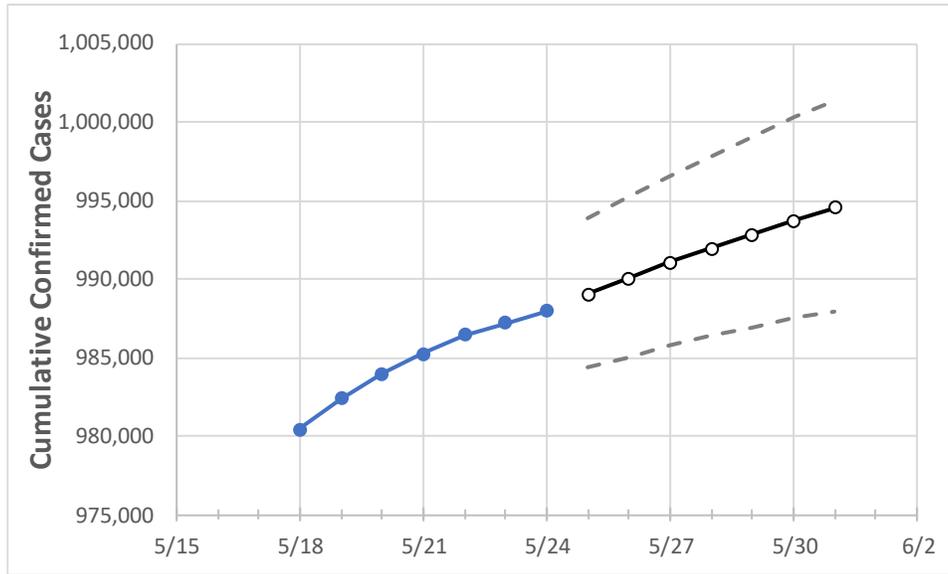
IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

Michigan State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Michigan	985,229	986,435	987,205	987,974	989,057	990,075	991,053	991,965	992,856	993,726	994,523

Note: The State’s projection shows a “best estimate” curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

Michigan Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Genesee	41,386	41,415	41,437	41,459	41,491	41,520	41,547	41,573	41,597	41,620	41,639
Ingham	24,605	24,625	24,637	24,649	24,672	24,695	24,717	24,737	24,757	24,774	24,791
Kent	71,965	72,181	72,263	72,344	72,453	72,557	72,655	72,748	72,843	72,933	73,017
Livingston	16,536	16,552	16,562	16,571	16,585	16,598	16,611	16,622	16,633	16,642	16,652
Macomb	98,988	99,094	99,154	99,214	99,299	99,380	99,455	99,525	99,593	99,657	99,717
Monroe	15,212	15,228	15,241	15,253	15,266	15,278	15,290	15,300	15,309	15,319	15,328
Oakland	117,046	117,168	117,224	117,279	117,403	117,517	117,629	117,739	117,848	117,941	118,036
Washtenaw	26,252	26,278	26,294	26,309	26,328	26,348	26,366	26,383	26,398	26,414	26,429
Wayne	163,016	163,220	163,359	163,498	163,667	163,825	163,970	164,115	164,250	164,374	164,488

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

Michigan Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	5/21	5/22	5/23	5/24	5/26			5/28			5/30					
Genesee	41,386	41,415	41,437	41,459	41,520	(8,304)	[1,993]	{996}	41,573	(8,315)	[1,996]	{998}	41,620	(8,324)	[1,998]	{999}
Ingham	24,605	24,625	24,637	24,649	24,695	(4,939)	[1,185]	{593}	24,737	(4,947)	[1,187]	{594}	24,774	(4,955)	[1,189]	{595}
Kent	71,965	72,181	72,263	72,344	72,557	(14,511)	[3,483]	{1,741}	72,748	(14,550)	[3,492]	{1,746}	72,933	(14,587)	[3,501]	{1,750}
Livingston	16,536	16,552	16,562	16,571	16,598	(3,320)	[797]	{398}	16,622	(3,324)	[798]	{399}	16,642	(3,328)	[799]	{399}
Macomb	98,988	99,094	99,154	99,214	99,380	(19,876)	[4,770]	{2,385}	99,525	(19,905)	[4,777]	{2,389}	99,657	(19,931)	[4,784]	{2,392}
Monroe	15,212	15,228	15,241	15,253	15,278	(3,056)	[733]	{367}	15,300	(3,060)	[734]	{367}	15,319	(3,064)	[735]	{368}
Oakland	117,046	117,168	117,224	117,279	117,517	(23,503)	[5,641]	{2,820}	117,739	(23,548)	[5,651]	{2,826}	117,941	(23,588)	[5,661]	{2,831}
Washtenaw	26,252	26,278	26,294	26,309	26,348	(5,270)	[1,265]	{632}	26,383	(5,277)	[1,266]	{633}	26,414	(5,283)	[1,268]	{634}
Wayne	163,016	163,220	163,359	163,498	163,825	(32,765)	[7,864]	{3,932}	164,115	(32,823)	[7,878]	{3,939}	164,374	(32,875)	[7,890]	{3,945}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.